CYLINDER RECORDS:
Significance, Production, and Survival

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This document is a response to requests for comments and data that might help to inform the National Recorded Sound Preservation Study. It describes the significance of cylinder phonograph records and offers quantitative estimates regarding their production and survival.

1 RESPONDENT'S BACKGROUND and AFFILIATION

I write partly as a private record collector and partly as a representative of the Association for Recorded Sound Collections (ARSC).

ARSC is a nonprofit organization, founded in 1966, dedicated to the preservation and study of sound recordings—in all genres of music and speech, in all formats, and from all periods. ARSC is unique in bringing together private collectors, historians, discographers, engineers, and institutional professionals, including representatives of some of the world's largest libraries and archives.

I chair the Cylinder Subcommittee of the ARSC Technical Committee, which developed the *ARSC Guidelines for Cylinder Playback Equipment* (funded by grants from the National Academy of Recording Arts & Sciences).

For more than thirty years, I have researched the history, technology, and products of the cylinder record industry. My personal collection currently includes 7,277 cylinder records, of nearly all types and brands.

In the interest of full disclosure, I am a Founding Member of the National Recording Preservation Board, representing ARSC.

2 SIGNIFICANCE of CYLINDER RECORDS

Mechanical sound-carriers configured in cylindrical form represent an important part of our recorded-sound heritage, for various reasons:

2.1 World's oldest format for sound recording and playback

Thomas Edison's tinfoil phonograph of 1877—which employed a thin sheet of metal foil, formed into a cylinder—was the first device to successfully "capture" and reproduce sound.

The earliest recorded sounds that can be heard today come from wax cylinders recorded by Edison (or his colleagues), for purposes of experiment and exhibition, in 1888. These cylinders are the incunabula of sound recording, just as Gutenberg Bibles are the incunabula of moveable-type printing.

2.2 Dominated the U.S. recording industry for 23 years

Commercial production of cylinder records for musical entertainment began at the Edison Laboratory, in May 1889—the genesis of the worldwide recording industry. From evolving styles of popular music—sentimental ballads, comic songs, military marches, ragtime, and jazz—to classical music, the recorded repertoire was broad and varied. Artists ranged from stage celebrities to versatile studio musicians paid to record what was asked of them. Entertainment cylinders brought minstrel shows, Broadway productions, vaudeville sketches, and operas to urban audiences, and also reached remote rural folks located far from theaters.

Though Emile Berliner demonstrated his Gramophone and lateral-cut disc records in 1888, Berliner's products were not manufactured in significant quantities until the late 1890s.

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Cylinder records ruled the market, well into the 1900s. For example, in 1901, Edison sold *eight times* as many cylinders as the Victor Talking Machine Company sold discs. In 1903, the Edison-to-Victor sales ratio was 4 to 1. Victor disc production did not eclipse Edison's 1903 cylinder volume until 1912.

Cylinder-sector sales thus led the U.S. recording industry throughout its first 23 years (1889 to 1912). Despite fluctuating sales and declining demand, several firms persevered, releasing new cylinder titles into the 1920s. The last holdout, Edison stopped making entertainment cylinders on July 6, 1929—ending forty years of musical cylinder production.

2.3 Vast global output produced by many small, lesser-known companies

Four firms account for a majority of the commercial cylinder records manufactured worldwide: Edison, Columbia, Pathé, and Edison Bell.

However, it is important to appreciate that *hundreds* of lesser-known companies produced *at least 536 brands of cylinder records*—primarily in the U.S. and Europe, but also in far-flung corners of the globe such as Australia, China, India, Japan, the Middle East, and South America.

These diverse recordings carry a rich sonic legacy representing cross-sections of many musical cultures, spanning two decades (roughly, 1890 to 1911, outside the United States).

2.4 Unique, "unpublished" historical recordings

Beyond the commercial entertainment products described above, tens of thousands of unique, noncommercial cylinders survive today, carrying "field recordings" of considerable anthropological, ethnographic, linguistic, or musicological importance. Other unique, unpublished cylinder recordings preserve our earliest oral history narratives and interviews.

As early as 1890, academic researchers were using cylinder phonographs "in the field," on scientific expeditions, to objectively capture music and speech for later transcription, analysis, and preservation—often by experts located far from the remote performance venue. Scientists and explorers continued to make extensive use of wax cylinders until the late 1930s, when portable electrical recording equipment became available.

2.5 Pioneering educational recordings

From the 1890s to the 1910s, several competing firms published courses of instruction in foreign languages, pairing a series of cylinder records with accompanying textbooks. Some of the leading correspondence courses were *interactive,* in that students recorded examples of their progress on wax cylinders, for evaluation by "professors."

Additional courses guided physical exercise programs, taught the vocal arts or cornet mastery, informed physicians about new developments in medical diagnosis and treatment, and even attempted to cure stuttering and stammering—all by means of cylinder recordings.

In the 1920s and again during World War II, the U.S. Army Signal Corps commissioned the production of special cylinder phonographs and Morse code records, for use in training and testing military telegraphers and radio operators.

2.6 Longevity of the cylinder format in business applications

Spoken-word business dictation was the earliest and most enduring application for sound recording in the cylinder format.

The Bell-Tainter Graphophone of 1887 was designed specifically for dictation purposes. The wax-coated cardboard tube known as "the Bell-Tainter cylinder" saw limited use, because of technical shortcomings

in the Bell-Tainter Graphophones. Nonetheless, the six-inch length of that cylinder persisted in office-dictation products of the Columbia Phonograph Company and their offshoot, the Dictaphone Corporation, for sixty years (1887-1947).

Similarly, the six-inch-long Edison Business Blank of 1905 led to the ubiquitous Ediphone- and Voicewriter-brand wax-cylinder blanks, manufactured well into the 1960s.

Between 1917 and the 1940s (and possibly longer), Edison and Dictaphone each distributed multiple series of cylinder records that provided instruction, exercise, and testing in stenography, typewriting, secretarial practice, speech, etc.

2.7 Highest quality audio now available from the "acoustic era"

The quality of sound potentially retrievable from many cylinder records is superior to that extractable from the contemporary acoustically-recorded shellac disc records. At first, that may seem to be a subjective or partisan claim, but the statement is based on solid technical facts.

Some enthusiasts—impressed by the audio fidelity of cylinders—have assumed that the vertical-cut cylinder recording method is somehow inherently better than the lateral-cut disc method. That is *not* the case; each method is limited by a distinctive set of technical tradeoffs and fundamental causes of audible distortion.

Most cylinders simply benefit from more consistent, accurate groove geometry and "quieter" surfaces, compared to acoustic-era shellac discs.

From 1889 onward, cylinders were recorded using precision-ground sapphire cutting styli, of standardized dimensions. The extremely sharp edge of the cylinder recording stylus was designed to cut exquisitely fine, high-resolution modulation features in the wax cylinder groove. As a result, the high-frequency capability of the cylinder recording process was limited by diaphragm resonance characteristics, not by the stylus tip size.

During the acoustic era, disc makers never standardized on a common groove geometry and their recording styli remained unsophisticated. For many years, the Victor Talking Machine Company cut masters using a #5 Sewing Needle—a very crude tool compared to Edison's sapphire recording stylus.

Cylinder records were designed to have very smooth surfaces, achieved by using homogeneous, high-purity wax or celluloid materials. From the earliest days of commercial production, cylinder playback styli were smoothly polished, rounded-tip sapphires or diamonds, sized to optimally match the groove profile, giving minimum noise and wear.

In contrast, the shellac compounds for disc records contain a high percentage of powdered limestone, a cheap filler that serves as an abrasive grit that grinds the steel needle to fit the groove, during playback. The limestone particles impose noise on the recorded audio signal, and the steel detritus left behind adds more noise, with each successive playing of the disc.

The Berliner Gramophone discs of the 1890s suffered from another source of noise: the acid-etch processing of the zinc master disc. The resulting pressed discs were quite noisy and did not compare favorably with the competing cylinder records, prompting Eldridge Johnson to substitute a wax-disc mastering process that eliminated the etching-caused noise from his Victor Records.

3 CYLINDER PRODUCTION

3.1 Types of Cylinder Records

In assessing the relative loss and survival rates of cylinder records, it is essential to first recognize that, over the years, various *types* of cylinders were manufactured, using diverse materials, constructions, and processes. One cylinder type can differ greatly from another in sound quality, ruggedness, long-term physical stability, and resistance to environmental influences.

For the purpose of making some tentative survival estimates, we may categorize nearly all cylinder records into three basic, generic types:

3.1.1 Brown-Wax Records (1889-1902)

For more than a decade, cylinder records intended for musical entertainment were most often cut on recordable cylinder "blanks"—hollow wax cylinders cast from metallic-soap compounds containing lesser percentages of natural waxes. These wax-like compounds came to be known as "brown wax"—though the color of the material varies from very light tan to dark brown, depending on manufacturing process conditions.

The earliest brown-wax records were directly-recorded "originals"—recorded either one-at-a-time or in multiples (using a bank of recording phonographs). By August 1890, some Edison cylinders were being duplicated from "master" records—probably by acoustical dubbing. From July 1891 on, it was common factory practice to produce brown-wax duplicates *pantographically*, by mechanically tracing a master record and coupling the motion of the tracing stylus to a cutting stylus, which copied the recording onto a wax blank. Most brown-wax records surviving today were made by mechanical duplication.

In the course of the duplication process, gradual wear and degradation of the master record limited the number of acceptable-quality duplicates that could be pantographed from a given master. To maintain a continuous supply of good-selling titles, studio managers often needed to call recording artists back, to make a new batch of master records. Over time, the company issued many *different* performances (later termed "takes"), all under the same catalog number and title, without any markings on the records to differentiate each take. Sometimes, when the original performers were unavailable for further work, substitute vocalists or musicians cut "re-makes"—again, usually issued under the same catalog number as the earlier version. Such variations in recorded content now complicate matters for catalogers, discographers, and collection curators.

The making of brown-wax records was not limited to the corporate recording studio, as was typically the case for disc records. Virtually anyone owning a cylinder phonograph was equipped to make recordings on brown-wax blanks, at home or "in the field." Home recordists could shave and reuse their soft-wax cylinders, a number of times.

3.1.2 Molded Black-Wax Records (1902-1923)

Brown-wax cylinders were constrained by the technical tradeoff between recordability and durability: the "wax" material had to be soft enough to be accurately cut by the recording stylus, yet hard enough to deliver an acceptable playback "life." Further, wax blanks intended for repeated use (in home recording or business dictation) needed to be readily shaveable, to prepare the recording surface for reuse.

On the other hand, a duplicate record intended strictly as a permanent copy, *for playback only,* could be made of a much harder, more durable material. In the late 1890s, the high demand for entertainment records drove the development of a rapid, low-cost duplicating process. After years of experiments, Edison's laboratory team devised a "black wax" metallic-soap compound suitable for molding high-quality duplicate cylinder records.

The new Edison Moulded Records, which began shipping in January 1902, employed the black-wax compound. (The more widely used brand name, "Edison Gold Moulded Records," was introduced in November 1903.) These hard-wax cylinders could be made to yield louder playback than the soft brown-wax records, without rapid wear, allowing the new molded product to compete more effectively with the rather loud-playing lateral-cut disc records.

Columbia followed suit with a cylinder molded of relatively soft brown wax—their XP Record—in March 1902. After August 1903, Columbia used a harder black-wax material for XP Records.

Major cylinder makers in Europe and elsewhere quickly adopted the black-wax molding technology. Only the smallest companies continued to produce brown-wax records (whether "original" or pantographed) after 1902.

These leading firms made black-wax cylinder records until, at least, the dates shown:

Columbia (December 1907 in England; May 1909 in U.S.)

Pathé (1906 in England; 1911 in France)

Edison (January 1914)

Edison Bell (December 1914)

Clarion Record Co., Ltd. (November 1923).

5.1.1 Celluloid Records (1900-1929)

Wax cylinders are fragile. If dropped, struck, or squeezed, a wax record is likely to be cracked or broken. Inventors seeking a more rugged material that could serve for the mass-production of duplicate cylinder records were attracted to celluloid (which had been developed for industrial molding processes in the 1870s). Thomas Edison considered using the material, early on, but instead chose to pursue waxes and metallic soaps—probably because, in the late 1880s, his focus was on *recordable* blanks.

In France, Henri Jules Lioret made a small number of celluloid cylinder records in 1893, followed by modest commercial quantities during the rest of the 1890s.

The first celluloid cylinders marketed in the U.S. were the Lambert Indestructible Records, manufactured in Chicago by The Lambert Company, between 1900 and 1905. The patent rights and technology of that firm (bankrupt by January 1906), passed on to the Indestructible Phonographic Record Company, which produced celluloid cylinders in Albany, New York from 1907 to 1922.

Edison wanted to use celluloid for making molded cylinders in 1900, but was barred from doing so by a court decision citing a prevailing Lambert patent. Faced with declining sales of wax cylinders in 1911, Edison reluctantly paid for a license permitting Thomas A. Edison, Inc. to mold cylinder records from tubes of celluloid.

The resulting Edison Blue Amberol Record debuted in October 1912. Until the end of 1914, Blue Amberol Records were derived from directly recorded wax "Cylinder Masters"—thereby closely duplicating the sonic quality of the master recording. In contrast, most Blue Amberols issued after December 1914 are second-generation copies, generated by acoustic (horn-to-horn) dubbing from a Diamond Disc Submaster to a Cylinder Master. Dubbed Blue Amberols are marked by a noticeably restricted audio bandwidth and increased noise and distortion.

The Blue Amberols released in June 1929 were the final commercially manufactured entertainment cylinders.

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5.2 Production Quantities

From July 1888 until August 1894, the North American Phonograph Company (NAPCo) controlled the authorized manufacture and distribution of cylinder phonograph records in the United States. NAPCo-era musical "phonograms" were nearly all deployed in coin-slot machines, arrayed in phonograph parlors located in a few major cities. (Almost no one personally owned a phonograph, at home, during this period.)

NAPCo, and some of its local "member companies," shipped perhaps just ten to twenty copies of a given title, at any one time, to the parlor operators. I don't have specific figures at hand, but I think it unlikely that the production of any given title exceeded 1000 copies, in total, during the NAPCo period.

After the August 1894 NAPCo bankruptcy, the "Columbia Phonograph Company, General" emerged as an independent player in the production and marketing of entertainment cylinders. Columbia's sister firm, the American Graphophone Company, pioneered in manufacturing affordable spring-motor machines designed for use in the home. By the time Edison's men founded the National Phonograph Company, in January 1896, the home-entertainment market was eager for music on cylinders.

Production of Edison brown-wax records increased each year from 1897 through 1899, leveling off at roughly two million per year, during 1899, 1900, and 1901.

With the introduction of the Edison Gold Moulded Record, Edison's cylinder sales surged to 4.38 million in 1902 and 7.66 million in 1903.

Unfortunately, I haven't yet found dependable production figures or sales figures for Columbia's cylinder record activity, and I hesitate to trust the numbers that Columbia sometimes gave in their advertising.

For example, in a 1903 popular-magazine ad, Columbia cited "Our enormous output of Two Million Records a month," claiming "We Hold the Record." However, in February 1904, the National Phonograph Company reported to their dealers: "An investigation into the output of every factory in the country making cylinder Records shows that we are to-day, and have been for months, making fifty per cent more Records than any other company. This statement is made on the most reliable information, and the claim of others to the contrary is the merest buncombe."

Perhaps Columbia tallied their *worldwide* production of cylinder and disc records, to yield the figure of 2 million records per month. Still, that impressive number (which implies an annual volume of 24 million Columbia records) must have been bold hyperbole created by the Columbia sales staff. The *Census of Manufactures* (taken every five years, between 1899 and 1919) indicates that the entire U.S. industry manufactured a total of 21 million cylinders and 4 million discs, in 1904.

The peak year for U.S. cylinder record production seems to have been 1907, when Edison was making as many as 110,000 wax records *in a single day*.

The next *Census of Manufactures* shows that 18.6 million cylinders and 8.6 million discs were manufactured in the U.S. during 1909.

By 1915, the average daily production of Edison Blue Amberol Records had fallen to approximately 20,000 records. Output eroded to 17,000 cylinders per day in 1918, but rose to a final peak in 1920.

Between 1911 and 1929, Edison sold a total of 21.4 million cylinder records—an average of 1.1 million per year.

Clearly, hundreds of millions of cylinder records were manufactured, worldwide, between 1889 and 1929.

5.3 Tally of Distinct Titles Issued on Cylinder Records

For some time now, I have been compiling a retrospective census enumerating the number of titles (that is, recorded "selections") known to have been commercially issued on various brands of entertainment cylinder records.

Most entries in my *Cylinder Record "Title Output"* spreadsheet are based on *exact* title counts, taken from catalog listings that I studied, series by series, for each major record brand and cylinder type. Just 13 of the 346 entries were based on the best available *estimates*—from my own judgment or provided to me by an expert familiar with a specific foreign brand.

My preliminary analysis shows that the global tally of commercial cylinder record titles is at least 73,414. Approximately 42,000 of those titles were produced in U.S. recording studios.

The eventual tallies will surely be much higher, since the *Cylinder Record "Title Output"* spreadsheet accounts for only 58 cylinder-record brands, while my *Cylinder Industry Database* currently lists more than *536* brands! (Sadly, we may never have access to the catalogs or company files needed to document the recordings produced by the smaller, now very obscure firms.)

6 CYLINDER SURVIVAL

6.1 Dispersion and Conservation: Where are the cylinders?

Despite their age and fragility, quite a few cylinder records survive today. Groups of cylinders reside in thousands of places, around the world, by chance or by intent. Naturally, the owners and custodians differ widely in their attitudes, goals, and activities surrounding these "old records."

6.1.1 Institutional Repositories

Cylinder collections in libraries, archives, museums, and historical societies tend to reflect the mission of the particular institution. They are likely to be more formally cataloged and stored under better ("archival") conditions than the typical private collection.

It seems that only a few institutional repositories now actively seek to acquire commercial entertainment cylinder records. More often, existing private collections were donated to the institution, at various points in the past, perhaps toward a goal of long-term preservation or broader public access.

A number of the larger institutional cylinder collections consist primarily of unique, noncommercial cylinders recorded long ago by academic researchers or scientific professionals. Happily, in many cases, preservation transfers have already been made from these unique historic artifacts, or are planned for the near future.

6.1.2 Private Collections

Many hundreds of private collections owned by individuals account for the majority of cylinders extant today.

Collectors can be very good custodians of their treasured objects. However, many collectors are not well informed about the preferred archival practices that would help to conserve their records; others don't have the resources to apply the best practices, even if they wish to.

Too often, collectors do not make plans for the ultimate disposition of their holdings. Important collections that took decades to gather, organize, and catalog are frequently broken up and widely dispersed, losing the integrity and accessibility the collection once had, as a localized whole. Worse, entire collections sometimes disappear into the trash heap.

Dealers
6.1.3

It's no secret that millions of "old records" are held—at least temporarily—by antique shops, resale stores, record shops, mail-order dealers, pawnshops, and auctioneers. Web-based auction services such as eBay now facilitate very active commerce in collectibles. More vintage records change hands today, more rapidly, than ever before.

One downside to the increased movement of cylinders and shellac discs is that the records are exposed to greater risk of damage or breakage in transit, when poorly packaged for shipment. Sought after, one-of-a-kind records have been destroyed at an increasing rate, in recent years.

Forgotten Caches
6.1.4

A few cylinder records still sit—unknown or forgotten—in attics, basements, garages, and barns, but most pre-1930 records were discarded or came into the hands of collectors between the 1950s and the 1970s, as the families who originally purchased the records (and their descendents) passed on or moved away. Only very seldom does a cache of new-old-stock cylinders turn up in some old warehouse or general store; something that occasionally happened in earlier decades.

Record Companies
6.1.5

Unfortunately, the firms that manufactured cylinder records did not keep their metal molds or example copies of their cylinder records for very long, after ceasing cylinder production.

Columbia and Pathé both turned their attention to disc product lines before 1910, and my understanding is that their corporate successors today hold no cylinders or cylinder molds at all.

Even Thomas A. Edison, Inc. reportedly dumped the bulk of their cylinder molds in a New Jersey landfill, around 1930; only a few select items were saved. The company *did* retain many of the Edison *disc* molds and example disc-pressings, which are now expertly conserved at the Edison National Historic Site, in West Orange, New Jersey.

Global Cylinder Survival: projected figures
6.2

In 1995, for an *ARSC Journal* article, I estimated that at least 300,000 cylinder records survive in public and private collections in the United States, "with fewer in Europe." I based that estimate on my knowledge of holdings in the largest U.S. and European institutions, and in major private collections, at that time.

Now, after ten years of monitoring eBay sales activity, I realize that *many* more cylinders are "out there," singly or in random groups, if not part of a formal collection. Thousands of cylinders have "come out of the woodwork," thanks to the economic incentive of an expanded, more lucrative marketplace.

I now believe that at least one million cylinders survive, worldwide.

Threats to Cylinder Survival
6.3

Like many historical artifacts, cylinder records are subject to threats posed by a variety of adverse influences. Archival conservation should seek to minimize the effects of these influences:

Humid Environments
6.3.1

Most types of "wax" cylinders are vulnerable to biological attack from fungi that feed on the natural-wax components of the metallic-soap compounds. Moisture and elevated humidity promote and accelerate these attacks.

Brown-wax records seem to be most susceptible to fungal growth, with black-wax records only slightly less so. Interestingly, the very hard metallic soap used to make Edison Amberol Records (and some late-production Edison Gold Moulded Records) appears to be immune to fungal attack, as are celluloid records (though their core materials may not be).

The best practice is to keep all types of cylinders clean, dry, and free from condensation.

6.3.2 Temperature Extremes

High ambient temperatures, caused by exposure to direct sunlight, steam-heat radiators, or tropical environments can soften and permanently distort or efface the recorded surface of many wax cylinders.

Celluloid cylinders are vulnerable to damage at low temperatures, because the celluloid sleeve is likely to contract against the constraining core, causing catastrophic splits in the sleeve. "Important" celluloid cylinders should not be taken outdoors or shipped during the winter months.

6.3.3 Handling and Transport

Different types of wax cylinders are composed of diverse metallic-soap compounds, with mechanical properties ranging from very soft to quite hard and brittle. For example, the playing surface of a soft brown-wax cylinder is vulnerable to physical scratching or abrasion that will distort or destroy the sonic-information content of the record. In contrast, Edison Amberol Records were made of a hard metallic soap that is now so brittle and fragile that even slight mechanical forces or temperature changes can catastrophically shatter the cylinder.

Personnel who handle cylinder records should be trained to recognize the different cylinder types and to treat each type appropriately.

6.3.4 Inherent Mechanisms that Cause Deterioration or Destruction

Some types of cylinder records are afflicted by inherent, ongoing physical or chemical failure mechanisms. These processes may doom the records to eventual destruction. Certain types have already been rendered unplayable (at least, by conventional means).

For example, celluloid cylinders can develop devastating cracks and splits in the record surface, caused by internal tension built up over time, as volatile camphor (originally employed as a plasticizer) gradually evaporates from the celluloid material, and the celluloid shrinks.

A few wax-cylinder compounds undergo chemical decomposition, such as efflorescence, in which a powdery "bloom" coats the surface of the record, interfering with the retrieval of the recorded sound. Efflorescence is sometimes mistaken for fungal mold or mildew, but it is not a biological phenomenon.

The best advice here is to transfer vulnerable recordings, as soon as possible.

6.3.5 Degradation or Damage from Playback with Improper Equipment

The nature and use of playback equipment affect the retrieved sound quality *and* the life of the sound carrier. When accurate playback is needed for archival transfer and preservation of cylinder recordings, antique cylinder phonographs should not be used. The *ARSC Guidelines for Cylinder Playback Equipment* describe a set of recommended features, functions, and minimum performance levels of equipment for archival-quality playback of cylinder records.

6.4 Titles Lost and Titles Extant: estimates by cylinder type

To provide an idea of "what has been lost" and "what is extant," let's consider the relative percentages of titles that can and cannot be found, as of 2007, for various types of commercial cylinder records.

Here, I define a *title* as "a given musical or spoken piece, listed under the name of a particular artist, in the catalog(s) of a specific company." Please note that I am not attempting to estimate the number of multiple performances (different recorded events: "takes" or "re-makes") issued for a specific title, over time. That level of detailed information is no longer available, for most types of cylinder records.

Extant means "at least one playable copy exists, somewhere."

The percentages given below convey my personal opinion, informed by discussions with other veteran record collectors. The numbers are based on our study of record-industry catalogs, together with decades of experience observing the modern-day trade in surviving cylinder records.

6.4.1 Brown-Wax Records Produced by NAPCo Local Member Companies (1889-1894): [98% of titles *lost*]

Virtually all of the records made locally by NAPCo member companies were played over and over, day and night, in coin-slot machines installed in public phonograph parlors. After perhaps 200 plays, the worn-out cylinders were discarded or recycled.

Phonograph Exhibitors, who traveled from town to town, demonstrating the novelty of recorded entertainment, may have been responsible for saving the very few member-company records that survive today. For example, only one Louisiana Phonograph Company cylinder is known to exist, and it is barely decipherable. A few *possible* Ohio Phonograph Company cylinders have been reported.

6.4.2 NAPCo-era Edison Records (1889-1894): [95% of titles *lost*]

The vast majority of these soft brown-wax records simply wore out, in coin-slot service.

6.4.3 Post-NAPCo Brown-Wax Records (1895-1902): [60% of titles *lost*]

Columbia, Edison, and smaller firms issued thousands of titles during this period. Some of the "big seller" titles turn up repeatedly today, but copies of the slower selling titles have been lost to fungus, breakage, etc.

6.4.4 Molded Black-Wax Records (1902-1912, in the U.S.): [90% of titles *extant*]

Copies of perhaps 90% of the domestic-U.S. "popular" Columbia and Edison titles can eventually be found, through persistent, far-reaching efforts. However, most foreign-series titles *cannot* be easily located today.

6.4.5 Indestructible Records (1907-1922): [98% of titles *extant*]

Celluloid cylinders manufactured by the Indestructible Phonographic Record Company have survived well, due to their rugged construction. Most titles can eventually be found.

6.4.6 Edison Blue Amberol Records (1912-1929): [99% of titles *extant*]

Essentially all of the U.S. popular series can be located (with some effort). Titles in certain foreign series are much more difficult to find.

6.5 Special-Case Collection: U-S Everlasting Records

The U-S Phonograph Company, of Cleveland, Ohio, was the last new firm to enter the U.S. market with a line of cylinder phonographs and records, challenging Edison and Columbia. Between 1910 and 1914, the Cleveland firm manufactured high-quality celluloid cylinder records, marketed under several brand names.

Intrigued by the history and products of this plucky upstart company, I decided in 1981 to attempt to acquire an example copy for each of the 1,190 issued "U-S Everlasting" titles. That objective is no easy task, because only one U-S record is typically seen for every 500 or so cylinder records examined. (U-S cylinders were produced in *much* smaller quantities than Edison cylinders.)

After 26 years of intense, devoted searching (and considerable expense), I've managed to gather examples for just 90% of the company's output.

I explain this here to illustrate the relative difficulty of building a comprehensive collection of scarcer cylinder records, beyond the rather common Edison products.

6.6 Preservation

Programs to make high-quality archival extractions from cylinder records (before the original carriers deteriorate further) can assure the long-term preservation of these historic recordings.

When prioritizing preservation activities for various types and series of cylinders, I suggest that attention be given first to:

those vulnerable types most in danger of deterioration, coupled with

those series with the fewest extant titles.

These criteria point strongly to the brown-wax records of the 1890s as candidates for the most urgent processing.